Air Force Research Laboratory|AFRL

Science and Technology for Tomorrow's Air and Space Force

Success Story

MANTECH'S AMU PROGRAM DRIVES DOWN COSTS, WEIGHT, AND SIZE IN VITAL DEFENSE SATELLITE PROGRAM

The Affordable Millimeter Wave Units (AMU) program has shown a 90% reduction in hardware, a 65% reduction in parts cost, a 50% reduction in board size and weight, and a module yield of greater than 95% in 19 GHz boards with 37 modules and 64 connectors. The production improvements provided through the AMU program will produce significant cost avoidances for critical Air Force satellite programs. It will make the difference in availability of specific systems and military capabilities to the warfighter.

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Accomplishment

The Manufacturing Technology (ManTech) Division of the Materials and Manufacturing Directorate, under a cost-sharing contract with Northrop Grumman, applied new forms of automated packaging radio frequency (RF) modules and millimeter wave units that drive down the cost, while also decreasing the size and weight of each unit. The AMU program now allows a rapid and highly repeatable automated assembly of module and board-level AMUs, with minimal labor and no hand tuning.

Background

Microwave and millimeter wave units for defense satellites are extremely expensive–sometimes totaling more than 20% of the cost of a satellite. Typical applications use these units in high quantities, although they are very expensive individually–as much as $50,000 per pound.

Defense satellite systems scheduled over the next few years will include more microwave hardware than ever before. Phased arrays will use thousands of microwave modules per satellite, and some satellite constellations will consist of as many as 20-30 satellites. Without less expensive microwave hardware, some of these key Air Force mission systems are unaffordable.

AMU's objectives were to sharply reduce the assembly and test costs of satellite microwave units by as much as 60% as well as reduce the size and weight of each unit by at least 10%. Early results indicate that this technology will typically meet and surpass all objectives. Under the new automated process, AMU's modules and units require no hand tuning due to precise assembly procedures and an optimum RF design. The new AMUs also include more printed components that further reduce cost.

The AMU program successfully demonstrated hardware designed specifically for three major defense satellite system programs. For near-term space systems, such as the Transformational Satellite, the Space-Based Infrared System Low, and the Advanced Extremely High Frequency (AEHF) systems, researchers estimate AMU technologies will save 50-80% of the cost of tens of thousands of modules, which previously would have cost several thousand dollars apiece. For example, the AEHF is now in development, and it has adopted and inserted AMU technologies in more than 100 RF board assemblies and nearly 10,000 RF modules.

For more information, contact the Technology Information Center by calling (937) 255-4689, and refer to TIC item number 02-253.

Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (03-ML-22)